Application SN 10/053,284 David Potts
Atty. No. 2104

Status of claims 6/17/2004

1. (previously presented) A method of subsurface waste water treatment within a leach field comprised of at least one conduit buried in soil near the surface of the earth, wherein waste water is continuously or repetitiously flowed into a generally horizontally running conduit and then into an aerobic influence zone in the soil, in which zone the biochemistry of the waste water is altered to become more environmentally benign, which comprises: delivering heat to the influence zone, to significantly heat the soil therewith.

2. (original) The method of claim 1 wherein the heat is delivered to the influence zone by flowing heated fluid through the conduit and then into the influence zone.

3. (original) The method of claim 2 wherein the heated fluid is air.

4. (original) The method of claim 3 wherein the temperature of the air is less than 120°F

5. (original) The method of claim 3 wherein air is drawn from a source which provides air with a found heat content; further comprising: flowing air into the conduit whenever the temperature in soil in or adjacent to the influence zone is less than the temperature of the found heat content air.

6. (original) The method of claim 1 wherein the temperature of the influence zone is raised by at least 5°F over the temperature which obtains in the absence of heating.

7. (original) The method of claim 1 wherein the heating is sufficient to maintain the influence zone at a temperature in the range 50-100°F.

8. (original) The method of claim 1 wherein heat is provided to the influence zone by imbedding at least one heating element within the soil which is within or adjacent to the influence zone.

9. (original) The method of claim 1 wherein heat is provided to the influence zone by means of a heating element within the conduit.

10. (original) The method of claim 8 wherein the heating element is in the portion of the influence zone which underlies the conduit.

11. (original) The method of claim 8 wherein in the heating element comprises a tube, further comprising: flowing a heated fluid through the heating element.

12. (original) The method of claim 1 wherein heat is provided to the influence zone by flow of heated fluid from a perforated tube buried within the soil which is within or adjacent to the influence zone.

13. (original) The method of claim 1 which further comprises: sensing the temperature in the influence zone, comparing said temperature to a reference temperature, and controlling the extent of delivering of heat according to the difference between the two temperatures.

14. (original) The method of claim 1 which further comprises: inhibiting vertically upward heat loss by insulating the soil above the conduit.

15. (previously presented) The method of claim 14 wherein a membrane laid on the surface of soil directly above the conduits and influence zone.

16. (original) The method of claim 1 wherein a geothermal source of heat underlies the soil containing the conduit, which further comprises: transferring heat from the geothermal heat source to the influence zone.

17. (currently amended) The method of renovating or restoring the function of a leach field comprised of at least one conduit buried in soil near the surface of the earth, wherein waste water is continuously or repetitiously flowed into a generally horizontally running conduit and then into an aerobic influence zone in the soil, in which zone the biochemistry of the waste water is altered to become more environmentally benign, which comprises: delivering heat to the influence zone, to significantly heat the soil therewith.

18. (original) The method of claim 17 which comprises temporarily ceasing the flow of waste water to the leach field, then heating the influence zone, then flowing air through the influence zone, and then resuming the flow of waste water to the leach field.

19. (previously presented) Leach field apparatus for treating waste water within soil which comprises:

a generally horizontally running conduit, buried near the surface of the soil, for conveying waste water into and within the soil, and for percolating waste water into an associated influence zone in the soil;

an influence zone in soil adjacent the conduit, for receiving the waste water from the conduit and for biochemically altering the waste water to make the waste water more environmentally benign; and,

means for heating the influence zone, to raise the temperature thereof and to increase biochemical activity therewithin.

20. (original) The apparatus of claim 19 wherein the means for heating comprises heating elements buried in the soil.

21. (original) The apparatus of claim 20 wherein the heating elements are tubes through which hot fluid circulates; further comprising: means for raising the temperature of hot fluid, to be circulated through the heating elements.

22. (original) The apparatus of claim 19 wherein the heating elements are within the soil of the influence zone.

23. (original) The apparatus of claim 19 wherein said means for heating comprises means for flowing heated air into the influence zone.

24. (original) The apparatus of claim 23 which further comprises: means for flowing heated air through the conduit and then into the influence zone.

25. (original) The apparatus of claim 24 wherein the means for flowing heated air comprises:

an air mover for pressurizing atmospheric air; and,

means for heating the atmospheric air.

26. (original) The apparatus of claim 25 wherein the air mover draws atmospheric air from within a building having an associated heat generating system; and, wherein said means for heating the atmospheric air comprises said associated heat generating system.

27. (original) The apparatus of claim 25 wherein the air mover is a blower and the means for heating the atmospheric air is purposeful inefficiency in operation of the blower.

28. (previously presented) The apparatus of claim 19 wherein said means for heating comprises means for transferring heat from a source of heat which is within soil spaced apart from the leach field.

29. (original) The apparatus of claim 28 wherein the source of heat is water within the earth underlying the soil.

30. (original) The apparatus of claim 29 wherein the means for transferring comprises a heat pump.

31. (original) The apparatus of claim 19 further comprising means for inhibiting vertical transfer of heat through soil above the conduit.

Amendment of paragraph at bottom of page 5.

Changes:

This application in part is related to my U.S. Pat. No. 6,485,647~~my patent application Serial No. 09/526,381~~ Method and Apparatus for Treating Leach Fields, filed March 16, 2000. As is described below, one embodiment of the present invention comprises using the teaching of the related patent application, where air or other reactive gas is flowed through the influence zone, to beneficially affect the biochemical activity which makes the waste water more environmentally benign. In the related application, various ways of causing air to flow through the influence zone are described; among them is flowing atmospheric air into the leach field conduits, and then into the influence zone. The related invention is referred here to as Leaching Field Aeration, or LFA. The description and drawings of the related LFA patent No. 6,485,647~~application Serial No. 09/526,381~~ is hereby incorporated by reference.

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Amendment of last full paragraph of page 12

Changes:

The invention can be used in combination with ~~know~~ known types of measurement and control systems. For instance, the temperature in the conduit or influence zone can be measured on an intermittent or continuous basis, and the amount of thermal energy input to the leach field will be a manipulated variable, according to the deviation of the measurement from a reference or set point which represents a condition which the user desires for temperature or some other parameter which is affected by temperature. The

control system will control energy input in ways that should be evident, for instance by controlling power or volume of heated liquid to heating elements, or by controlling air flow. For example, the controlling will comprise: sensing the temperature in the influence zone, comparing said temperature to a reference temperature, and controlling the extent of delivering of heat according to the difference between the two temperatures.

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